



265806

REFERENCE

43

SITE NAME

Diamond Shamrock
Painesville Works

SITE ID

04D9866 11909

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

REGION V

IN THE MATTER OF:

DIAMOND SHAMROCK CORPORATION
 Proceedings Under Sections
 3013(a)(1) Of The Resource
 Conservation And
 Recovery Act, 42 U.S.C.
 §6934(a)(1),

ADMINISTRATIVE
CONSENT ORDER

V-W-3013-2

Respondent.

The following recitals and findings are made and agreed to under this Administrative Consent Order between the United States Environmental Protection Agency ("U.S. EPA") and Diamond Shamrock Corporation ("Diamond") issued pursuant to the authority vested in the Administrator of the United States Environmental Protection Agency, and duly redelegated, under §3013(a)(1) of the Resource Conservation and Recovery Act ("RCRA"), 42 U.S.C. §6934(a)(1).

RECITALS AND FINDINGS OF FACT

1. Diamond is the owner of a 100-acre tract of real property ("the Site") located on the Grand River in Painesville Township, Ohio. Between approximately 1931 and 1972, Diamond operated a chromium chemicals plant on the Site. During that period, approximately three-quarters of one million tons of chromate waste materials were generated by the plant and disposed of on the Site.

2. On October 7, 1980, the United States commenced a civil action on behalf of the Administrator of the United States Environmental

INTRO
 1 GU monitor
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Protection Agency against Diamond under RCRA Section 7003, 42 U.S.C. §6973, in the United States District Court for the Northern District of Ohio, Civil Action No. C80-1857, alleging that the chromate wastes on the Site may present an imminent and substantial endangerment to human health or the environment.

3. In 1982 Diamond completed an extensive closure program, which began in 1978. The program included, among other things, the placement of a protective clay cap over the surface of the Site, all at a capital cost in excess of \$4 million. Diamond also commissioned an 18-month study of the aquatic life in the Grand River upstream of, adjacent to, and downstream of the Site.

4. Diamond has provided U.S. EPA with a hydrogeologic study and other information regarding this Site. Diamond also presented to U.S. EPA the results of its 18-month aquatic study which indicates that the Site is not causing any measurable adverse effects upon the aquatic life of the Grand River.

5. Pursuant to Section 3013(a)(1) of RCRA, 42 U.S.C. §6934(a)(1), the Regional Administrator has the authority to issue Orders requiring the owner of a site to conduct monitoring, testing and analyses, and to furnish the results to U.S. EPA, where there is present at a site a hazardous waste.

6. The chromate waste materials are hazardous wastes as defined in §1004(5) of RCRA, 42 U.S.C. §6904(5). Therefore, the Site and adjacent areas of the Grand River must be subject to a continued monitoring, inspection, and reporting program and contingency plan in accordance with the terms of this Order. Diamond has agreed to undertake this program and plan and does not contest the authority and jurisdiction

of the Administrator to issue this Order. For the foregoing reasons, the parties to the lawsuit have agreed to cause the civil action to be dismissed by the Court without prejudice upon execution and lodging with the Court of this Administrative Consent Order ("Order").

7. Diamond and U.S. EPA do each consent to this Administrative Order without Diamond's admission of liability and without trial, adjudication, or admission of any issues of fact or law.

ORDER

Diamond shall, unless otherwise provided herein, comply with the following requirements commencing within thirty (30) days of the entry of this Order:

I

July 14th, 1983

GROUNDWATER MONITORING PROGRAM

1. Diamond shall maintain groundwater monitoring wells at the locations set forth in Appendix E and at other locations in accordance with this Section.

2. To supplement its existing groundwater monitoring system, Diamond shall install additional groundwater monitoring wells to monitor groundwater levels and chromium concentrations at the Site.

(A) Wells shall be located and installed in accordance with a well installation plan. This plan shall be submitted by Diamond to U.S. EPA within sixty (60) days of the entry of this Administrative Consent Order. The plan shall include well construction specifications and an installation schedule. The plan shall detail the results of a thermal study conducted on January 7, 1983,

as well as the results of the soil boring study conducted pursuant to Section I.2(B) below.

- (B) Within thirty (30) days of the entry of this Order, Diamond shall also conduct soil borings in areas mutually agreed upon as a result of the January 7, 1983 thermal study.
- (C) The plan shall provide for monitoring wells in the area lying between the Site and the Grand River. These well shall be proposed in areas confirmed by the soil borings to display high chromium content and/or significant groundwater flow.
- (D) The plan shall propose two monitoring wells to be installed in the interior of the Site.

3. Wells shall be installed within sixty (60) days of the U.S. EPA's approval of the well installation plan. A copy of the well installation plan shall be submitted to Ohio EPA at the same time it is submitted to U.S. EPA.

4. After well installation is completed a survey shall be conducted to establish well-head elevations with respect to a fixed point, preferably mean sea level. The wells shall be so surveyed every two years for the first six (6) years. After six (6) years, the parties will review the data and determine the frequency of further survey.

5. The monitoring wells, except existing upgradient wells presently identified as #6 and #7, shall be measured for groundwater elevations monthly for two years after which time they shall be measured quarterly for the next eight years and semiannually for the remainder

of the Groundwater Monitoring Program. Groundwater elevations shall be measured annually in upgradient wells #6 and #7. A river level measurement shall be taken concurrently with groundwater elevation measurements.

6. Groundwater sampling shall be performed in accordance with Appendix E and be analyzed for pH, total chromium and hexavalent chromium in accordance with Appendix A. All wells, except wells #6 and #7, shall be sampled monthly for the first year, quarterly for the next nine years, and semiannually for the remainder of the 30-year Groundwater Monitoring Program, unless otherwise provided pursuant to Section X.7. Groundwater sampling shall be performed annually for wells #6 and #7 for the entire Groundwater Monitoring Program.

7. Groundwater Monitoring Log Sheets shall be maintained in accordance with Appendix E, detailing sampling results, groundwater elevations, weather conditions, and water levels of the Grand River during sampling. These log sheets shall be signed by the sampling team members.

8. All monitoring wells shall be maintained in good working condition and protected from damage and unauthorized access. Damage to wells shall be detailed in the Groundwater Monitoring Log Sheets and repaired as quickly as possible.

9. In order to determine whether or not there is an annual increase in groundwater elevation within the Site, while accounting for seasonal fluctuations, the interior wells shall be monitored and assessed as follows:

- (A) Water levels shall be recorded monthly in the above wells for a period of two years and quarterly for the next eight years and semiannually for the remainder of

remedial work. Existing fence posts and telephone poles may be marked for this purpose. Additional markers shall be placed along the top of the berm paralleling the Grand River.

3. A Site Inspection Log Sheet shall be prepared and signed by the individuals who conduct the inspection and shall be maintained, all in accordance with Appendix C. Conditions which require maintenance or repair shall be noted and maintenance or repairs shall be completed as quickly as possible. All maintenance and repairs shall be documented in the Site Inspection Log Sheet.

4. Diamond shall take or cause to be taken oblique aerial color photographs of the Site at the commencement of the Site Inspection and Maintenance Program, and every five years thereafter. These photographs shall be taken so as to accurately depict the conditions on the Site over time. Each series shall include views of the Site from the North, South, East and West directions.

5. Site inspections shall be conducted quarterly for an initial ten-year period and semiannually for the succeeding twenty-year period. In addition, Site inspections shall be conducted on the next working day following the end of any sustained rainfall event greater than 2.2 inches in any 12-hour period as measured at the National Weather Service Station at the Cleveland Hopkins International Airport. Any damage or defects in the site cover or slopes shall be noted and repairs completed as quickly as possible.

IIIGRAND RIVER MONITORING PROGRAM

1. Diamond shall monitor the Grand River by sampling at two designated locations adjacent to the Site. The locations are described below and designated on the map in Appendix B. The locations are hereinafter referred to as the "river sampling locations." The designated locations are:

- (A) Upstream of the Site, at the Route 20 bridge, and,
- (B) Downstream of the Site, approximately 1,000 feet beyond Diamond's pipe bridge, and above the City of Painesville Wastewater Treatment Plant.

2. In accordance with the sampling procedures set forth in Appendix B, three (3) grab samples shall be taken at equal time intervals at both river sampling locations over a six-hour period and analyzed individually in accordance with Appendix A. A Grand River Monitoring Log Sheet shall be maintained in accordance with Appendix B. Log Sheets shall detail sampling results, weather conditions during sampling, water level, daily precipitation, and appearance of the Grand River, and shall be signed by the sampling team members.

3. The Grand River water samples shall be analyzed for total chromium, hexavalent chromium and pH in accordance with Appendix A.

4. Sampling at the river sampling locations shall be performed monthly for the first ten-year period and quarterly for the succeeding 20-year period, subject to such changes in frequency as may be required by weather conditions or otherwise as provided in Section X.7.

5. An average hexavalent chromium value will be calculated for the three (3) grab samples obtained at the downstream sampling location

for each day of sampling, pursuant to Section III.2. A one-tailed Students 't' test shall be applied to the logarithms of these values at the end of the first two years of the Grand River Monitoring Program in order to determine the upper 95 percent confidence limit value (t95). This value shall represent an "Action Level" for hexavalent chromium.

(Whenever the term Action Level appears it relates solely to measurements of hexavalent chromium.) If the mean value of the three (3) grab samples taken at the downstream location pursuant to Section III.2 at any time subsequent to the first two years of monitoring exceeds the Action Level, Diamond shall implement the Contingency Plan described in Section IV.

6. At the conclusion of the first two years of river monitoring Diamond shall calculate the Action Level and notify U.S. EPA and the Ohio EPA, in writing, of the results of its computation and methods of calculation.

IV

CONTINGENCY PLAN

1. At any time during the Grand River Monitoring Program described in Section III, should the mean value of the three (3) grab samples taken at the downstream locations exceed the Action Level, Diamond shall initiate the following course of action:

- (A) A series of samples shall be taken at each river sampling location in accordance with Appendix B. This series shall consist of three (3) grab samples taken at equal time intervals at each river sampling location over a six-hour period, commencing on the first working day

immediately following discovery of the initial sample exceeding the Action Level. If the mean value of the three (3) grab samples taken at the downstream sampling location exceeds the Action Level, Diamond shall within 24 hours notify U.S. EPA and Ohio EPA (by telephone and/or express mail) that the Contingency Plan has been activated. Diamond shall also immediately initiate the following:

- (1) All dikes and sloped surfaces on the Site shall be inspected following the procedures set forth in Appendix C. Any conditions which require remedial maintenance shall be documented and remedied promptly.
- (2) The north bank of the Grand River immediately adjacent to the Site shall be inspected and ten (10) equally-spaced grab samples of the Grand River collected along the north bank.
- (3) The groundwater monitoring wells shall be sampled in accordance with Appendix E.
- (4) Grab samples shall be taken every fifteen (15) minutes, for a period of two hours, from the surface drain outfalls, beginning as early as possible after the first rainfall event sufficient to produce runoff.
- (5) Three grab samples shall be taken at equal time intervals, over the course of six hours, at the river sampling locations. These

samples shall be taken on the same day each week for four weeks.

(B) At the completion of the sampling period pursuant to Section IV.1(A)(5), Diamond shall calculate the mean of the hexavalent chromium data from the downstream location. This calculation shall be compared with the mean of the hexavalent chromium data obtained during the first two years of river monitoring pursuant to Section III.4 for that location through use of the one-tailed Students 't' test at the upper 95 percent confidence level. These calculations should be submitted to U.S. EPA and Ohio EPA upon completion. If there has been a statistical increase, Diamond shall develop a remedial action plan and implementation schedule to reduce the hexavalent chromium concentrations in the river to below the Action Level. The plan shall be submitted to U.S. EPA and Ohio EPA within fifteen (15) days of completion of the sampling period identified in Part IV.1(A)(5). U.S. EPA shall have thirty (30) days to comment, approve, or object to the plan. If U.S. EPA comments or specifically objects to any portion of the plan within the 30-day time period, Diamond shall not implement that portion of the plan without resolution of the disputed items. If U.S. EPA approves the plan or fails to comment or object, Diamond shall implement the remedial action plan. EPA's approval of a plan shall not relieve Diamond of any obligation to take further action under

this Section if the plan fails to reduce hexavalent chromium concentrations below the Action Level.

- (C) Upon completion of remedial actions conducted pursuant to Section IV.1(B) samples shall be taken at the downstream river sampling location three times a day at equal intervals of time on the same day each week for four weeks and, after an interval of one month, one additional day's sampling, to verify that the Action Level is no longer being exceeded.

2. Diamond shall submit interim reports every fifteen (15) days to U.S. EPA and Ohio EPA summarizing the progress of the investigations and any remedial maintenance. A detailed final report shall be submitted to U.S. EPA and Ohio EPA within thirty (30) days of completion of the investigations and any remedial maintenance.

V

RECORDKEEPING AND REPORTING

1. Diamond shall provide U.S. EPA and Ohio EPA within 30 days following the close of each quarter, copies of all Grand River Monitoring Log Sheets, Groundwater Log Sheets, and Site Inspection Log Sheets for that quarter. Copies of supporting laboratory data shall be provided to U.S. EPA and Ohio EPA on request. Diamond shall also provide any log sheets not yet due within thirty (30) days of a request by U.S. EPA or Ohio EPA.

2. Diamond shall provide to U.S. EPA and Ohio EPA at least ten (10) days notice of any routine sampling or inspection. In the event

that such sampling or inspection must be rescheduled, Diamond shall provide U.S. EPA and Ohio EPA 24-hour notice.

3. All records prepared in compliance with this Order shall be retained by Diamond and be available to U.S. EPA and Ohio EPA and their designated representatives for inspection and copying during normal business hours until this Order by its terms expires, including but not limited to the following:

- (A) This Order, including any attachments or modifications thereto;
- (B) The Grand River Monitoring Log Sheets;
- (C) The Groundwater Monitoring Log Sheets;
- (D) The Site Inspection Log Sheets; and
- (E) Supporting laboratory data.

VI

NOTICE IN DEED TO PROPERTY

1. A notation shall be recorded on the deed to the Site or on some other instrument which is normally examined during a title search filed with the Recorder, Lake County, Ohio, disclosing that:

- (A) The land has been used to dispose of hazardous wastes as defined by the Resource Conservation and Recovery Act, 42 U.S.C. §6904(5); and
- (B) Use of the Site in a manner which would disturb the integrity of the final cover, or any component of the containment system, or the function of the Site's monitoring system is prohibited, unless the Regional Administrator (Region V of U.S. EPA) determines that the

disturbance is necessary to the proposed use of the property, and will not increase the potential hazard to human health or the environment, or is necessary to reduce a threat to human health or the environment.

2. A survey plat and record of the type, estimated location, and estimated quantity of the chromate wastes disposed of on the Site shall be filed with the appropriate local zoning authority and with the Regional Administrator, U.S. Environmental Protection Agency, Region V.

3. A copy of this Order shall also be filed with the Recorder, Lake County, Ohio, as an attachment to said deed or other said instrument.

VII

RESOLUTION OF DISPUTES

1. In the event that U.S. EPA and Diamond disagree concerning their rights and obligations under, or concerning the proper interpretation of this Order, representatives of each shall confer and attempt expeditiously and in good faith to resolve any such disagreement.

2. In the event that the parties are able to resolve their disagreement, the terms of such resolution shall be reduced to writing, signed by authorized representatives of each party, and deemed to modify or supersede this Order to the extent of any inconsistency.

3. In the event that the parties cannot resolve their disagreement, this Order is then deemed to be final for purposes of a judicial review and enforcement.

4. Nothing contained in this Part shall be construed so as to limit the rights reserved in Section IX of this Order.

VIIIDELAY IN PERFORMANCE AND STIPULATION OF PENALTIES

1. If any event occurs which causes delay or may cause delay in the timely achievement of the requirements of this Order, Diamond shall notify U.S. EPA and Ohio EPA in writing within five (5) working days of the event, describing in detail the anticipated length of the delay, the precise cause or causes of delay, the measures taken and to be taken by Diamond to prevent or minimize the delay and the schedule by which these measures will be implemented. If a delay has been or will be caused by circumstances beyond the control of Diamond, the time for performance hereunder shall be extended for a period equal to the delay resulting from such circumstances provided, however, that any excused delay or prevention of any intermediate requirement shall not result in the excused delay or prevention of any subsequent requirement if the subsequent step can reasonably be implemented without completion of the prior step. Diamond shall take all reasonable action to minimize or avoid any delay or prevention of the performance of the obligations under this Order.

2. Increased costs of performance of the requirements of this Order shall not be circumstances beyond the control of Diamond justifying an extension in the time for performance.

3. Nothing contained herein shall be construed so as to relieve Diamond of its duties to performs its obligations under this Order even though delays in performance of such obligations may be excused by events beyond the control of Diamond.

4. Diamond shall pay the United States, upon demand by U.S. EPA, a stipulated penalty in an amount up to \$500 for each day it unjustifiably fails to meet its obligation:

- (A) To notify U.S. EPA under Section I.9(B) that the annual average water level for any subsequent year in either interior monitoring well exceeds the annual average of the previous year;
- (B) To notify U.S. EPA under Section IV.1(A) that the mean value of the three (3) grab samples taken at the downstream location exceeds the Action Level and that the Contingency Plan has been activated;
- (C) To submit to U.S. EPA under Section IV.1(B) within fifteen (15) days of completion of the sampling period identified in Part IV.1(A)(5) a remedial action plan and implementation schedule;
- (D) To submit to U.S. EPA under Section IV.2 an interim report every fifteen (15) days and a final report within thirty (30) days of completion of the investigations and any remedial maintenance;
- (E) To submit to U.S. EPA under Section V.1 within 30 days following the close of each quarter copies of all Grand River Monitoring Log Sheets, Groundwater Log Sheets, and Site Inspection Log Sheets for that quarter;
- (F) To notify U.S. EPA under Section IX that Diamond has received information that a substantial structural failure of the cap has occurred or is about to occur.

5. The stipulated penalties shall be paid by certified check made payable to the Treasurer of the United States.

6. The stipulated penalties set forth above shall not preclude U.S. EPA from electing to pursue any other remedies or sanctions, including statutory civil penalties up to the maximum amounts authorized by law, which may be available to U.S. EPA by reason of Diamond's failure to comply with the requirements of this Consent Order. Diamond reserves its right to contest the imposition or amount of any stipulated penalties under this Section.

7. In the event of dispute between U.S. EPA and Diamond in respect of the imposition of stipulated penalties, or the amount thereof, Diamond and U.S. EPA shall attempt to resolve any disagreement in accordance with Section VII.

8. Section VIII.4 shall not apply to Diamond with respect to an obligation for which Diamond is secondarily liable.

IX

RESERVATION OF RIGHTS

Notwithstanding any other provisions of this Order, U.S. EPA expressly reserves all rights available to it under any and all applicable statutes and regulations of the United States, and the common law.

Distribution of any plans, reports, notices or other information to the Ohio Environmental Protection Agency shall not be construed as affecting the rights or obligations of that Agency or the State of Ohio.

Notwithstanding any other provision of this Order, upon the receipt of information that a substantial structural failure of the cap

has occurred or is about to occur, Diamond shall commence mitigative measures and shall immediately notify U.S. EPA and Ohio EPA.

Notwithstanding any other provisions of this Order, Diamond reserves the right to raise any defense in any action to enforce the terms of this Order or in any other proceeding. This Order shall not be construed as an admission of liability or of any fact or as a waiver of any defense in fact or law, except as to the Administrator's authority and jurisdiction to issue this Order.

X

MISCELLANEOUS

1. Any sampling, analytical work, inspections, remedial maintenance, or repairs required by the Order shall be carried out by qualified personnel selected by Diamond.

2. Copies of any notices, reports or requests with respect to this Order shall be delivered to the persons at the following addresses (or such other address as the person addressed may designate by notice to the others):

(A) To Diamond Shamrock:

Manager, Environmental and Safety Services
Chemical Unit
Diamond Shamrock Corporation
1100 Superior Avenue
Cleveland, Ohio 44114
(216) 694-5352
(216) 353-2318 (24-hour Emergency Response number)

(B) To U.S. EPA or the Regional Administrator:

Director, Waste Management Division
U.S. Environmental Protection Agency
Region V
230 South Dearborn
Chicago, Illinois 60604
(312) 886-7579

*in-house
env. engr.
Paul Dugas
694-5351*

(C) To Ohio EPA:

Chief, Division of Hazardous Materials Management
Ohio Environmental Protection Agency
361 East Broad Street
Columbus, Ohio 43215
(614) 466-7220

3. The provisions of this Order shall be binding on the parties, their successors and assigns, and shall govern the rights and obligations of any successor in interest of the Site. If any successor in interest agrees in writing to assume Diamond's obligations under this Order, Diamond shall become secondarily liable for such obligations.

4. Diamond or any successor in interest shall establish financial assurance for the annual costs of monitoring and maintenance under this Order through one of the mechanisms in 40 C.F.R. §§265.145 and 265.151 (1982 Supp.). Nothing in this Section shall be construed as an admission that the Site is subject to the regulations promulgated pursuant to Section 3004 of RCRA, 42 U.S.C. §6924.

5. Nothing contained herein shall be construed so as to excuse Diamond from compliance with any applicable regulations of the Occupational Safety and Health Administration (29 C.F.R. Part 1910), or any other applicable federal, state and local laws or regulations.

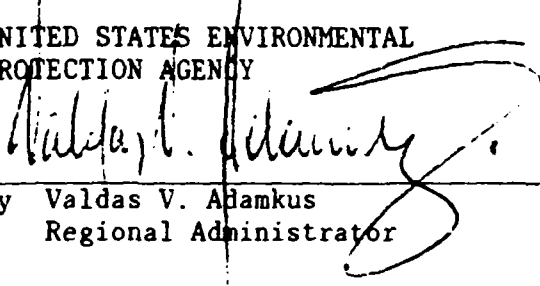
6. U.S. EPA, Ohio EPA and their designated representatives shall have authority to enter the Site at all reasonable times for the purposes of inspection and sampling. Where this Order requires that Diamond take action on the next working day, U.S. EPA may take such action prior to the first working day if it determines that emergency action is necessary. Diamond shall allow U.S. EPA and Ohio EPA to observe actions undertaken pursuant to this Order. Samples obtained by any person shall be split upon request.

7. At the request of either party, at the end of the initial five-year period and at the end of each five-year increment thereafter, U.S. EPA and Diamond shall review all sampling data and other information and conditions pertinent to the Site to determine whether this Order should be modified in any respect or terminated.

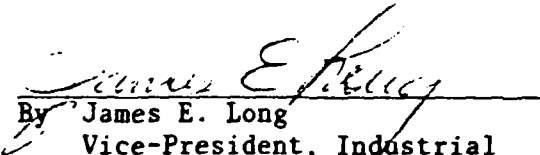
8. This Order shall expire thirty (30) years from the date hereof, unless otherwise agreed pursuant to the terms of this Order.

Entered as to this 14th day of July, 1983, with the agreement and consent of the parties.

UNITED STATES ENVIRONMENTAL
PROTECTION AGENCY


By Valdas V. Adamkus
Regional Administrator

DIAMOND SHAMROCK CORPORATION


By James E. Long
Vice-President, Industrial
Chemicals

APPENDIX A

Water Sample Analysis Procedure

- A. The following lab analytical equipment is needed:
- 1) One pH meter, for measuring sample pH to nearest 0.1 unit.
 - 2) Hexavalent chromium analytical equipment described in the analytical method attached.
 - 3) Total chromium analytical equipment described in the analytical method attached.
- B. All well and river water samples collected shall be iced at time of collection. All well samples shall be returned to the lab on the day of collection. All samples from the Grand River will be returned to the laboratory immediately after being obtained. The time of laboratory receipt shall be noted in a permanent record book maintained in the lab.
- C. Sample pH shall be analyzed within two hours of receipt in the lab, and recorded in the permanent record book.
- D. All well and river water samples will be allowed to stand no more than one hour following pH analysis to allow sediment to settle. Samples for hexavalent chromium analyses will be decanted from the top of the sample collection container prior to analysis.
- E. Subsequent to D above, the Grand River samples will be filtered using a 0.45 μ membrane filter. Well samples will be decanted. All total dissolved chromium samples will be preserved. The preservation procedure used will be to add 5 ml HNO_3 per liter of sample, as per U.S. EPA guidelines. The sample will be analyzed by the method described on the attached sheet. The analytical sample container will be labeled with all sample collection container label data, and analysis designation: Cr(total)
- F. All hexavalent chromium analytical samples will be analyzed by the method described on the attached sheet within 8 hours of receipt in the laboratory. The analytical sample container will be labeled with all sample collection container label data, and analysis designation: Cr^{+6} .
- G. All analytical results will be recorded in the permanent record book, and on the appropriate Log Sheets as required by the Administrative Consent Order.
- H. In the absence of prior requests for split samples from responsible agencies, all samples may be disposed of in an appropriate manner once analysis is complete.

- I. Improvements may be made in these procedures as experience dictates and as mutually agreed between Diamond Shamrock and U.S. EPA, Region V.

METHOD OF ANALYSIS OF RIVER AND WELL WATERS FOR Cr^{+6}
BY THE DIPHENYLCARBAZIDE METHOD

Principle

In acid solution, S-diphenylcarbazide reacts with hexavalent chromium (Cr^{+6}), yielding a soluble, strongly colored red-violet product. The intensity of the resulting color is proportional to the concentration of Cr^{+6} . Solutions of unknown Cr^{+6} concentration are determined by comparison to a calibration curve derived from known standards.

Reagents and Equipment

S-diphenylcarbazide - Dissolve 0.2 g S-diphenylcarbazide in 100 ml ethanol; dilute to volume in a 500 ml volumetric flask with 10% (volume) H_2SO_4 . Store in a brown bottle, refrigerated.

Potassium Dichromate, ACS Reagent Grade - $\text{K}_2\text{Cr}_2\text{O}_7$

Sulfuric Acid, 6N - H_2SO_4

UV - VIS Spectrophotometer

Polystyrene Cuvettes

Miscellaneous Class A Glassware (Flasks, Pipets, etc.)

Analytical Balance

Procedure

A. Calibration Curve:

- 1) Dissolve 0.2830 g $\text{K}_2\text{Cr}_2\text{O}_7$ and dilute to volume in a 1,000 ml volumetric flask. Mix.
- 2) Pipet 10 ml of Solution (1) into a 1000 ml volumetric flask and dilute to volume. Mix. This solution (2) contains 1 ug/ml of Cr^{+6} .

Procedure

A. Calibration Curve: (Continued)

- 3) Into each of five 100 ml volumetric flasks, pipet 10, 20, 30, 40, and 50 ml, respectively, of solution (2). Dilute each flask to approximately half volume. The flasks contain 10, 20, 30, 40, and 50 ug of Cr^{+6} , respectively.
- 4) To each of the five 100 ml flasks, add 4 ml of 6N H_2SO_4 . Mix.
- 5) To each of the five 100 ml flasks, add 3 ml of S-diphenylcarbazide solution. Dilute to volume and mix.
- 6) Using polystyrene cuvettes, read the absorbance of the five standard solutions at 540 nm wavelength.
- 7) Plot the results as absorbance vs. ug Cr^{+6} to form the calibration curve.

B. Sample Analysis:

- 1) Split the decanted sample into two portions.
- 2) Dilute a sample aliquot, if necessary, with serial dilutions, such that a 10 to 25 ml aliquot contains 10 to 50 ug Cr^{+6} .
(This is easily accomplished by diluting the sample until the characteristic yellow imparted by Cr^{+6} disappears. Past experience indicates that the human eye can detect yellow imparted from 1 ppm Cr^{+6}). In a similar manner prepare an aliquot for use in turbidity correction.
- 3) Pipet an aliquot containing 10 to 50 ug Cr^{+6} into a 100 ml volumetric flask. Dilute to half volume and mix. For samples containing less than 0.1 ug/ml Cr^{+6} , use 90 ml sample aliquots.

- 4) Add 4 ml 6N H_2SO_4 to sample and turbidity blank. Mix.
- 5) Add 3 ml S-diphenylcarbazide solution. Mix.
- 6) Dilute both sample and turbidity blank to volume and thoroughly mix.
- 7) Set instrument to 540 nm wavelength. Insert the turbidity blank and set the absorbance to zero. Measure the absorbance of the sample. (If vanadium is present in high concentration, allow the sample to stand 10 minutes for full color development.)
- 8) Read the Cr^{+6} chromium concentration from the calibration curve of absorbance vs. $\mu\text{g Cr}^{+6}$ in the 100 ml flask.
- 9) Calculate the sample Cr^{+6} concentration.

General Notes

Past experiences with Grand River samples indicate that dilution is rarely required. In fact, Cr^{+6} concentrations often are below the detection limit of 0.01 $\mu\text{g Cr}^{+6}$ /ml.

METHOD OF ANALYSIS OF RIVER AND WELL WATERS FOR TOTAL Cr
BY ATOMIC ABSORPTION SPECTROSCOPY

Principle

Aqueous chromium may be determined by measuring the atomic absorption of the sample solution at a characteristic chromium spectral wavelength. Solutions of unknown chromium content are determined by comparison to a standard calibration curve.

Reagents and Equipment

Atomic Absorption Spectrophotometer

Miscellaneous Class A glassware

Air (dry, filtered)

Acetylene (commercial grade) (C_2H_2)

Deionized (chromium free) water (D.I. H_2O)

Nitric Acid, concentrated reagent grade (HNO_3)

Hydrogen Peroxide, 30% reagent grade (H_2O_2)

Potassium Dichromate, reagent grade ($K_2Cr_2O_7$)

Procedure

A. Calibration Curve

1. Dissolve 0.4830 g $K_2Cr_2O_7$ and dilute to volume in a 1000 ml volumetric flask. Mix.
2. Pipet 10 ml of solution (1) into a 100 ml volumetric flask and dilute to volume. Mix. This solution (2) contains 10 ug/ml of Cr^{+6} . (10 ppm)
3. Into each of four 100 ml volumetric flasks containing 0.5 ml HNO_3 pipet 0, 10, 20, and 30 ml (respectively) of solution (2). Dilute to three-fourths volume and mix. Add 1 ml H_2O_2 , dilute to volume, and mix. The four flasks contain 0, 1, 2, and 3 ug/m/Cr, respectively.
4. Using standard AA techniques, measure the absorbance of each standard solution.
5. Plot the calibration curve as absorbance vs. ug/ml Cr.

Procedure (Continued)

B. Sample Analysis

1. If necessary, dilute the sample with serial dilutions using 0.5 percent HNO_3 such that a 10 to 25 ml aliquot contains 100 to 300 ug of Cr.
2. Pipet an aliquot containing 100 to 300 ug Cr into a 100 ml volumetric flask. Add 1 ml of H_2O_2 to the flask. Dilute to volume, mix, and measure the absorbance of the solution according to standard AA practice.
3. Using the calibration curve, read the concentration of Cr in ug/ml. If dilution was required, calculate the concentration of Cr in the original sample. If Cr is not detected, report the detection limit concentration for that day's analysis.
4. For Grand River samples containing less than 0.2 ug/ml total dissolved Cr, utilize scale expansion capability of instrument to achieve optimum sensitivity of measurement. Three standard solutions and a blank shall be used to calibrate the instrument from zero to 200 ug/l total dissolved Cr.

General Notes

H_2O_2 is added to ensure that all Cr present is in the trivalent state. Trivalent and hexavalent Cr exhibit different AA sensitivities.

Standard AA techniques employed in any AA analysis, include measures such as aspirating water blanks between standards and samples.

Spectral interference from dissolved iron is controlled by the addition of ammonium chloride (2% by wt. in sample, standards, and blanks as appropriate).

Phosphate interference is overcome by calcium chloride addition.

All operating parameters shall be consistent with the instrument manufacturer's recommendations. Wavelength to be used is 357.9 nm.

QUALITY ASSURANCE PROGRAM

The accuracy of the data will be monitored by the incorporation of duplicate samples, spiked samples, field blanks and reference samples and standards in the analytical program. These additional procedures and analysis are meant to detect errors in the analysis introduced by field contamination or by laboratory error. If the analysis is not validated by the QC procedures, Diamond shall take the necessary steps to obtain a sample analysis which is validated by these procedures.

Duplicate Samples

At frequencies of one in ten well samples and of one in six river samples, a duplicate sample will be taken. These duplicate samples are to be labelled "QC" in the field on the sample label next to the river point number or well number. These samples are to be obtained and handled in the same manner as the rest of the samples. Sufficient sample should be obtained for subsequent sample splitting in the laboratory.

On receipt of a QC sample in the laboratory, the sample is to be well-mixed by inverting the shaking to assure a homogeneous mixture, then split into two approximately equal portions. One portion is to be analyzed with the other samples obtained the same day. The "QC" designation is to be carried through on all reporting data.

The results on the duplicate samples must be within $\pm 10\%$ for the analysis to be accepted as valid.

Spiked Samples

The portion of the duplicate sample split in the laboratory and retained is to be spiked with a known volume of chrome standard to yield approximately double the expected level of chrome in the sample. For river samples this would require the addition of chrome to yield a level of about 0.05 mg/l. For the wells the level of chrome varies widely; therefore, the analyst must refer to historical data to determine the appropriate level of spike.

The spike sample is to be analyzed for total and hexavalent chrome with the rest of the samples obtained on that day. The percent recovery is to be determined. Data is to be reported with the rest of the data and labelled "QC-spike".

Recovery must be between 90% and 110% for the analysis to be accepted as valid.

Exception

Well No. 4 has historically yielded levels greater than 2,000 mg/l. The sample dilution necessary for analysis of this well introduces errors which are difficult to quantify. For this reason, this well is to be excluded from duplicate sampling for Quality Assurance purposes.

Field Blanks

A liter of metal-free water will be provided to the samplers by the laboratory. This is to be from the same source as the dilution water used in the laboratory. The samplers will take this to the sample site(s) and transfer a portion to a sample bottle from the same lot as the bottles used for the actual samples. This is to be labelled "Field Blank" and returned to the laboratory. All analyses are to be performed on this sample, along with the other samples taken that day. The results will be reported with the other data and labelled "Field Blank". A field blank is to be prepared with each sampling event.

The determination of chromium in the Field Blank at levels above the lab blank will indicate field contamination of the samples and the series will be resampled.

Reference Samples

Independently prepared reference sample(s) shall be obtained and analyzed quarterly. These results shall be recorded in the permanent lab record book.

Calibration Curves

A complete set of standards and blanks are to be run with each set of analyses, assuming a sample frequency of once per month or less. This will negate any analytical error introduced by cathode tube decay or reagent aging. Stock 100 ug/ml Cr^{+6} standards will be prepared quarterly.

Sample Containers

All sample containers are to be glass or plastic. If possible new containers should be used. If containers are reused, they should be washed with a suitable detergent, rinsed with tap water, rinsed with a 1:1 nitric acid-water mixture, rinsed with tap water and finally with successive portions of distilled water. This may require as many as 12 to 15 rinses.*

Analytical Glassware

All volumetric glassware will be "Class A" or NBS-certified. The analytical glassware must be cleaned in the same manner discussed relating to sample containers, i.e. detergent washed, tap water rinse, 1:1 nitric acid rinse, tap water rinse followed by successive distilled water rinse.

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- * Ref.: Handbook for Analytical Quality Control in Water and Wastewater Laboratories; U.S. EPA, 1979, EPA/600/4-79-019.

APPENDIX B

RIVER WATER SAMPLING PROCEDURE

- A. Collect the sampling equipment in the vehicle.
- 1) Sample collection container extension arm, about 10 feet long.
 - 2) 7 - Sample collection containers of about 1,000 ml capacity, either glass or plastic, in a storage rack.
 - 3) 7 - Prepared sample container labels, respectively:
No. 1, No. 2 and Blank. Identify space on each label for collection date and time. (Containers cannot be pre-labelled because the containers will be submerged in the river.)
 - 4) 1 - Pair of boots for each member of the sample team.
 - 5) 1 - U.S. Coast Guard approved life vest for each member of the sample team.
 - 6) All necessary sample log sheets.
 - 7) 1 - Field Blank of Distilled Water.
- B. Each sample team will have at least two members. For safety, each team member will work within sight and sound of the other(s). Although the need for additional safety gear, such as safety lines, is not now anticipated, sample procedures must be evaluated for safety at each collection site during their initial use. The effects of bad weather (rain, snow, ice, high river level, etc.) shall be explicitly considered.
- C. Notify someone of the sample team's departure and expected return times, then proceed to the initial sample collection site. Samples may be collected in any convenient order. Sample collection sites are shown on the attached drawing.
- D. After arrival at the sample collection site, all team members will put on all protective gear, including life vests, prior to any sample collection activity.
- E. Mount the sample collection container on the sample container extension arm.
- F. The sampler should stand as close to the river bank as is safe, near the sample collection site marker. At least one other member of the team will keep the sampler under close observation at all times.

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- G. Extend the sample collection container out over the river the full length of the extension arm. Submerge the sample collection container no more than 2 feet below the river surface, allowing water to flow into the container. Withdraw the sample collection container from the river and move back several paces from the river bank. Cap the sample container securely, dry the container, and affix the appropriate label, recording sample collection date and time. Record all required data on the sample log sheet.
 - H. Remove the sample collection container from the extension arm, and replace the container in the sample container storage rack.
 - I. Return all equipment to the vehicles, and proceed to collect the other sample in a similar manner.
 - J. When sampling is complete, return all samples and equipment to the lab for storage. Flush sediment off sample container extension arm with tap water prior to storage.
 - K. Personnel safety is most important. Sampling will be scheduled, or rescheduled, to coincide with reasonable environmental conditions at the sample collection sites.
 - L. Improvements in this procedure may be made as future experience dictates.

**GRAND RIVER MONITORING LOG
DIAMOND SHAMROCK CHEMICAL COMPANY
CHROMATE SITE, PAINESVILLE, OHIO**

INSTRUCTIONS

The Grand River Monitoring Log Sheet will be completed for routine river monitoring, any follow up monitoring, and investigations conducted pursuant to the Contingency Plan. All samples will be analyzed for hexavalent chromium, total chromium, and pH. Each sample taken will be assigned a number to be used in reporting sample results. Lab data sheets, including associated quality control documentation will be attached to the Grand River Monitoring Log Sheet.

I. INSPECTION INFORMATION

Date of Inspection <u> </u> / <u> </u> / <u> </u> month day year		Time of Inspection
Inspectors	Title	Signature
Weather Conditions (Include precipitation data, appearance of the Grand River, etc)		
River Level (Staff gauge reading or equivalent)		

II. RIVER SAMPLING

Sampling Station	Sample Results (ppm)				
	Sample #	Time Taken	Cr (VI)	Cr (total)	pH
A					
B					

III. Other Observations or Field Data Gathered (Provide narrative description)

IV. - ATTACHMENTS (Attach lab data sheets and other pertinent information)

APPENDIX C

Site Inspection Procedure

- A. Collect all equipment needed in vehicle.
1. One-pair boots for each member of the inspection team.
 2. All necessary inspection log sheets and site map.
 3. Three six-foot stakes with streamers for each team member.
 4. Lensatic compass.
 5. Cameras
- B. Before going to the site, review all conditions identified in the previous inspection. Record status of those conditons in this inspection.
- C. Notify someone of the inspection team's departure and expected time of return, then proceed to the site. Park near groundwater well 6B on the northwest corner of the site. Each member of the team shall wear boots and clothing suitable for the weather, and carry inspection log sheets, a general site map (see attached log sheet and map) and carry 3, 6-foot stakes with streamers for marking any site deficiencies noted during the inspection. Each inspection team will have at least two members and each member will complete and inspection log at the site. The location and conditions will be identified on site with a stake and on the map. Map references will be identified by a number and magnetic azimuths to:
- (1) marked and numbered fence posts on the north side of the site, and
 - (2) marked and numbered utility poles on the west side of the site.
 - (3) markers on the berm of the dike.
- This will allow back azimuths to be followed to locate the same area of the site on future inspections. A brief summary of the conditions with the same reference number will be noted on the inspection log sheet.
- D. Inspect the site on foot when weather permits. The inspection team will check for erosion, apparent health of vegetation, visible leaching of material, sinkholes, shift in surface contours, evidence of material in surface runoff, sample well integrity, etc. Instances of unsafe walking conditons (steep, slippery, etc.) should be noted. Photography should be used to document problem conditions.

- E. One inspector will proceed along the dike paralleling Fairport Nursery Road in an easterly direction. Particular attention should be given to the dike integrity, Well 6B integrity, any evidence of ponding water and erosion along the water way adjacent to the dike toward the east end of the property.

From the mid-point of the site eastward, the site is upslope south of the dike (to the inspector's right). The inspector should note any incidence of erosion, sinking or contour shift in this area. On reaching the eastern end of the site, the inspector should check the headwall and drainage channel from the site to the east.

The inspector should then proceed along the dike south and then southwest observing the dike integrity, and the cap on the site to his right. The inspector should continue along the dike until meeting the other inspector at a point upslope from Well No. 4.

- F. The second inspector will proceed south along the dike toward the river. Dike integrity, Wells 5 and 2 integrity, evidence of ponding, erosion, contour shifts, sinkholes, etc. will be noted. The headwall and drain at the southern tip of the site will be noted.

The watershed to this point is upslope from the discharge. Attention should be given to sinking, erosion etc. in the drainage area. Particular attention should be paid to signs of burrowing animals in the dike.

The inspector will continue along the dike northeast from the point and continue until meeting the first inspector upslope of Well No. 4.

- G. On meeting, the inspectors will turn north and quarter around the high point of the site in opposite directions, inspecting the piezometer integrity and the cap condition. On meeting the north side, the inspectors will proceed to the high point of the site.
- H. From the high point of the site the inspectors will move south and west, one paralleling Fairport Nursery Road and the other paralleling the maintenance road. They will quarter right and left to give maximum site coverage and proceed until reaching a point approximately 100 yards east of the drainage swale at which point they will move south to the maintenance road.
- I. Both inspectors will go to the east side of the site along the maintenance road. The integrity of Well No. 4 will be noted. The inspectors will proceed south, one along the drainage channel and one approximately 50 yds. west of the channel. On reaching the proximity of the river, they will wheel to the right (west) and proceed with the inspection. The integrity of all wells along the river will be observed, as well as any water discoloration along the river, sinkholes or leaching overland. After passing the last well, the inspectors will return to the maintenance road and inspect Wells 1 and 1A.

- J. After inspecting Well 1 and 1A, both inspectors will proceed up-slope to the southern tip of the site, i.e., at the discharge culvert. The inspectors will proceed north along the waterway, quartering northwest and northeast from the bottom of the waterway into the site about 50 yards then turning at right angles to that course, proceed back to the waterway. They will continue in this manner, quartering back and forth along the waterway to the north side of the site. In the course of this progression, the integrity of the piezometers in the cap will be noted.
- K. Once the inspection team returns to the vehicle, any problems shall be discussed. Any indicated additional inspection action shall be planned and implemented before returning to the lab.
- L. The inspection team will return to the lab and file their inspection log sheets in the Site Inspection Log Book, a copy of which will be maintained in the office of the person responsible for site work.
- M. All site maintenance work performed in response to problems noted during inspections will be recorded in the Site Inspection Log Book.
- N. The same personnel will perform the inspections, if feasible, to facilitate recognizing gradual changes.
- O. Improvements in this procedure, such as more clearly defined inspection routes, may be made based on experience.

The Site Inspection Log Sheet will be completed for routine site inspections, follow up inspections, and site investigations conducted pursuant to the Contingency Plan. A brief summary of site conditions will be provided in the appropriate sections and any relevant observations will be referenced, by number, to their physical location on the attached site map. Evidence of chromium migration and physical site deterioration will be documented through both sampling and photographic documentation.

Samples will be taken of any leachate seeps, discolored soils, or discolored runoff and sampling locations identified on the site map. Each sample taken will be assigned a sample number to be used in reporting sample results. All samples will be analyzed for hexavalent chromium, total chromium, and pH. Lab data sheets, including associated quality control documentation, and photographs will be attached to the Site Inspection Log Sheet.

Date of Inspection / / mon. day year		Time of Inspection _____
Inspectors	Title :	Signature

Weather Conditions (Include river level precipitation data, appearance of the Grand River, etc.)

II. SITE OBSERVATIONS (Provide narrative description)

Cap Subsidence or Erosion

Dike Subsidence, Shifting, or Erosion

Vegetation Damage

Soil Discoloration

River Bank Erosion

Leachate or Seepage

Discolored Runoff

Damage to Monitoring Wells

Damage or Blockage of Surface Drains

Other Evidence of Site Damage or Instability

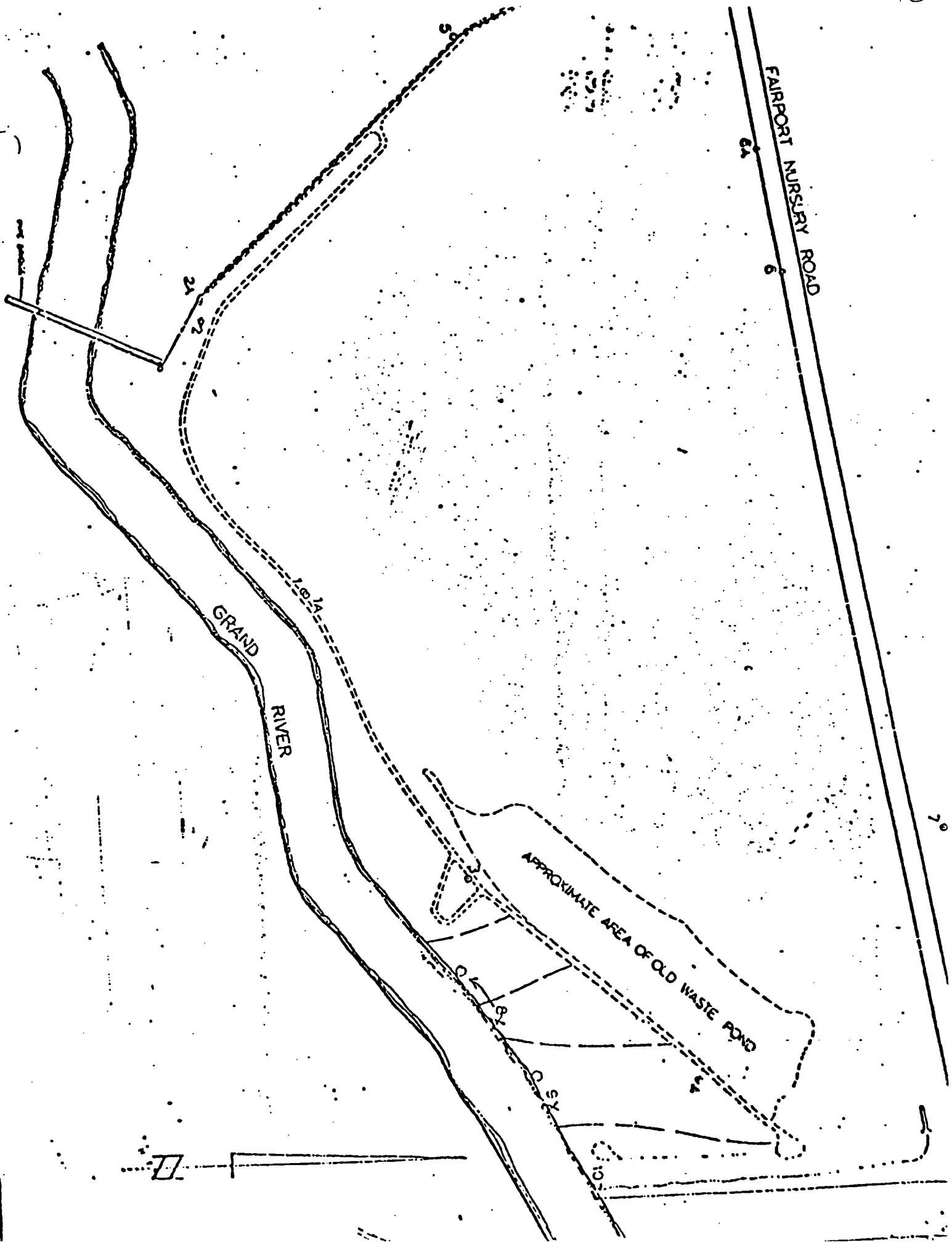
III. SAMPLES TAKEN

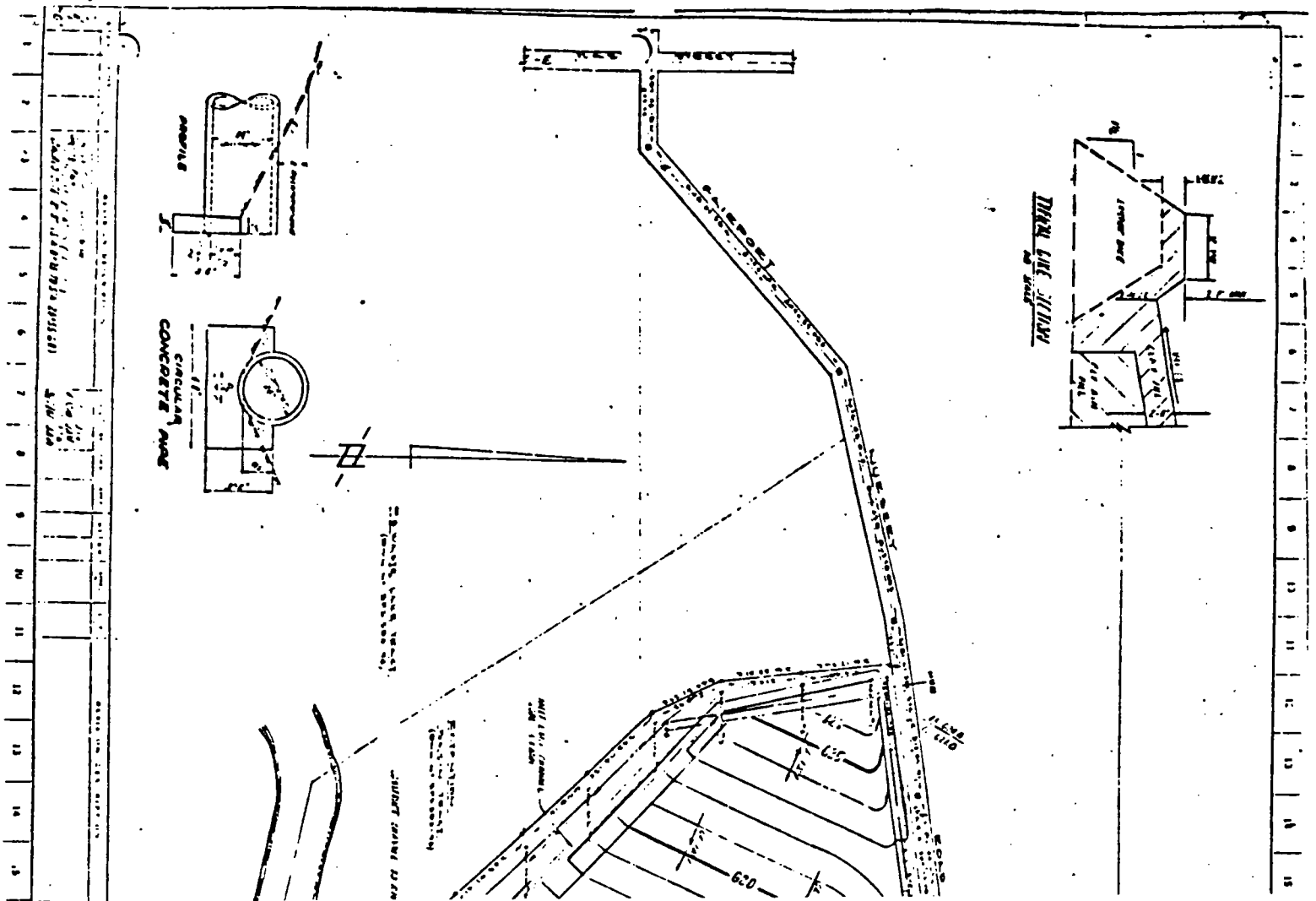
Sample Type	Sample #	Sample Results (ppm)		
		Cr (VI)	Cr (total)	pH
Soil				
Runoff				
Leachate				
Other				

IV. OTHER FIELD DATA GATHERED (Provide narrative description)

V. REMEDIAL ACTIVITIES (Describe planned remedial maintenance, repairs, or further studies, as well as any remedial activities conducted since the last inspection.)

VI. ATTACHMENTS (Attach site reference map, lab data sheets, photographs, and other pertinent information)





APPENDIX D

Bank Stability Monitoring

The primary concern of this program is the potential long-term erosion of the bank with the bank retreat northward toward the waste site.

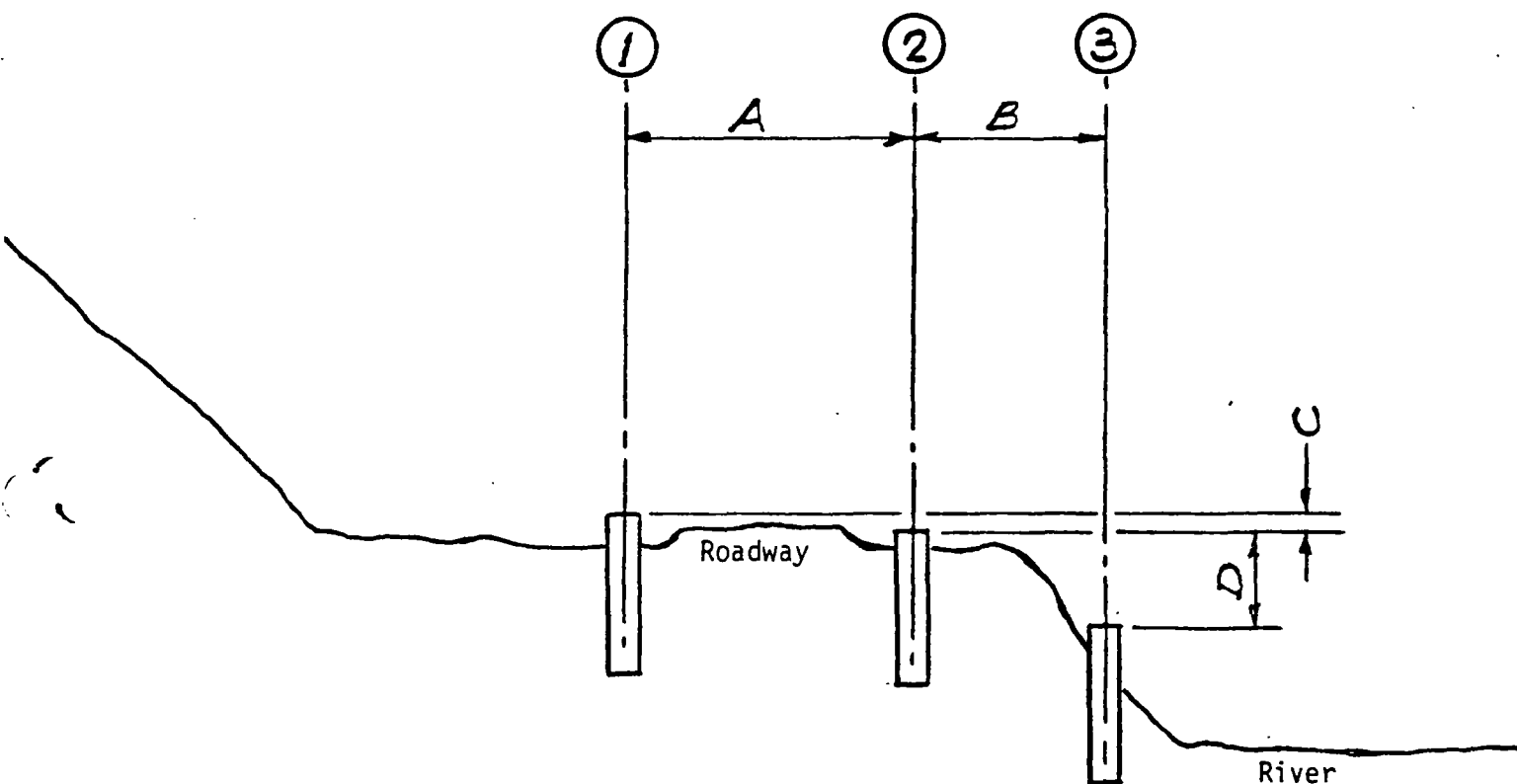
1. At a point in the vicinity of Wells 1 and 1A three markers will be installed, each consisting of a 4 to 6 inch diameter pipe set approximately 4 ft. into the ground, filled with concrete and with registration marks in each one. (See drawing attached)
2. Annually determine measurements 'A', 'B', 'C', and 'D'. Log these data for comparison to future measurements. This inspection will be performed in the second quarter of the year (April - June).
3. Equipment
 - a. Surveyors chain
 - b. Transit and rod
 - c. Plumb bob
 - d. Level
 - e. Beam and leveling bipod
 - f. Camera
4. Set-up the transit in the road an appropriate distance from the markers. Level the transit. One member of the team will place the rod on the reference mark of the northern-most marker. A sighting will be made to this point. This is '0' elevation. Sightings will then be made to the second and third markers. Elevations of the second and third markers relative to the first marker will be recorded to the nearest 0.01 foot.
5. The distance from the registration point on the northern-most marker (No. 1) to the middle marker (No. 2) will be measured to the nearest 0.01 foot using the surveyor's chain.
6. The distance from the registration point on marker No. 2 to the registration point on the down-slope (No. 3) marker will be measured as follows:
 - a. Place one end of the beam on marker No. 2 with the other end projecting over marker No. 3. Place the leveling bipod in a position to roughly level the beam and support the down-slope end.
 - b. Using the level and the screw adjustment on the bipod, level the beam.
 - c. Adjust the plumb bob to the registration mark on marker No. 3.

- d. Mark the beam at the registration point of marker No. 2 and at the origin point for the plumb bob.
 - e. Disassemble the apparatus and measure the distance between the marks on the beam.
 - f. Record the measurements between markers.
7. Log the measurements in a permanent log maintained for this purpose. File the field sheets.
 8. During the inspection, a minimum of twelve (12) color photographs will be taken of the bank marker area. These will illustrate the condition of the bank and markers. At least one photograph will be taken from the embankment on the south side of the Grand River, opposite the bank stability markers. The photographs will be filed with the annual measurements.
 9. As experience is accumulated, alternate methods of making the measurements may become apparent which will expedite this operation. Revised procedures will be submitted to the EPA representative responsible for the site and, after approval by the Agency, be utilized.

BY _____ DATE _____
 CHKD. BY _____ DATE _____

SUBJECT Chrome Site
Bank Stability Marker
Section at Wells 1 and 1A

SHEET NO. _____ OF _____
 JOB NO. _____



- A = Distance* from Marker 1 to Marker 2.
- B = Distance* from Marker 2 to Marker 3.
- C = Vertical Distance* from top of Marker 1 to top of Marker 3.
- D = Vertical Distance* from top of Marker 2 to top of Marker 3.

* All measurements to be made to the nearest 0.01 ft.

APPENDIX E

GROUND WATER WELL SAMPLING PROCEDURE

A) Collect the sampling equipment in vehicle:

- 1) Well depth-to-water measurement cable.
- 2) Two samplers w/cable attached, labelled A and B, in dust covers. Check to ensure integrity of dust covers and proper cleaning recorded in previous sample log sheet. If a possible contamination problem is indicated, clean the samplers (see Item No. G.)
- *3) Plastic sample collection bottles w/lids, prelabelled, secured in rack, volume not less than bailers. Labels should be Wells (I.D. NO.), 4 labels, Initial, and Final, Sampler A and B, respectively. Spaces for sample collection date and time should be identified on each label.
- 4) Two gallons of distilled wash water in container(s) with pump or spigot, labelled (for use in washing samplers in field).
- 5) Two squeeze bottles of distilled water, labelled (for use in washing samplers in field).
- **6) One empty 20 gallon container, with lid, labelled (for use in collecting bailed water).
- 7) Rubber gloves for each member of the sampling crew.
- 8) One large plastic funnel to use in collecting wash/rinse water.
- *9) One plastic funnel which fits securely inside sample collection bottle neck.
- 10) One foot ruler, marked in 0.01 feet, to measure to nearest 0.01 foot.
- **11) Two empty one-gallon containers, labelled (for use in collecting bailed water at wells without close vehicle access).
- 12) All keys necessary to unlock all groundwater well covers, and site gates.
- 13) All necessary sample collection log sheets.

* These items are procedures needed only for well sampling, not separate well bailing trips.

** These items needed only for well bailing trips, not separate well sampling trips.

- B. Be sure to tell someone about your departure and expected return times, then proceed to the site. For safety, at least two people should do all field work, staying within sight of each other. Sample wells starting with those expected to contain the least amount of chromium and working up to those expected to contain the highest level of chromium, roughly. Initial sample collection order, based on existing data:

<u>Sample Collection Order</u>	<u>Well Number</u>	<u>Sampler Use</u>
1	7	A
2	6B	A
3	5	A
4	2A	A
5	1	B
6	1A	B
7	3	B
8	10	A
9	9	B
10	4	B

- C. Unlock well cover, remove, set aside with lock attached.
- D. Measure and record depth to water in well from lip of well casing (or 2" diameter sample well lip, whichever sticks up further) to sample well water surface (distance "A"). Depth measuring cable marked in feet, so use foot rule to measure between markings to nearest 0.01 foot.
- E. Remove dust cover from sampler, storing cover in vehicle. Remove water in well using bailer, continuing to bail until last bail is only partially full. Collect bailed water in 20 gallon container, or in plastic containers when remote from vehicle. If inflow exceeds the bailing rate, remove four volumes of water contained in the casing.
- F. When well bailing is complete, re-cap and lock well cover in place.
- G. Rinse sampler 3 times, using about 100 ml distilled water each time. Wash outside of sampler with squeeze bottle of distilled water. Collect the rinse and wash water in the 20 gallon collection container for return to lab. Put sampler back into dust cover. Rinse well depth-to-water measurement cable tip and rubber glove surfaces, collecting the rinse water in the 20 gallon container or in plastic one gallon containers when remote from vehicle.
- H. Proceed to bail all wells in this manner. Time should then be allowed for water levels to recover sufficiently to provide enough water sample, to be determined by experience. Initially, allow about 1 day after bailing before sampling. Sufficient sample is about one full bailer, around 800 to 1,000 ml. Complete sample log sheet for each sample collected.
- I. Return to lab. Dispose of the bailed water and collected wash/rinse water in an appropriate manner. Store equipment in an appropriate

manner, if necessary. Rinse the inside of each sampler with 100 ml distilled water, and collect both washings in labelled plastic containers. "Initial Sampler A" and "Initial: Sampler B", recording the collection date and time on the container labels. Return samplers to dust covers.

- J. After about one day following bailing (see Item No. A), load all sampling equipment (see Item No. A) back into the vehicle, if necessary. Be sure to tell someone about your departure and expected return times, then proceed to the site. For safety, at least two people should do all field work, staying within sight of each other. Sample wells in the same order they were bailed.
- K. Unlock and remove the well cover, setting it aside with lock attached.
- L. In early sampling, it may be necessary to measure the well depth-to-water (see Item D) to determine the time it takes well water levels to recover sufficiently to permit collection of one full bailer, proceed with sampling. If the water level has not recovered sufficiently, wait another day before sampling. If the water level has still not recovered sufficiently within 7 days, proceed with sampling, if possible, otherwise skip sampling this well on this round. Make appropriate entry on the well sampling data sheets.
- M. Remove sampler dust cover, storing cover in vehicle. Lower sampler down well, ending with sampler top about 1 foot below well water surface. Bring up one full sampler, storing the collected water in the appropriately marked sample container. Cap the container, then record the collection date and time on the sample bottle label.
- N. Clean the equipment as per Item G. Collect the wash/rinse water in the plastic gallon containers. Rinse the sample collection funnel, collecting the water in the plastic containers. Re-cap the well and lock the cover in place. Put the sampler back inside the dust cover.
- O. Proceed to sample all wells in this manner.
- P. Return all equipment to the lab. Rinse the inside of each sampler with 100 ml distilled water and collect the rinse water in containers labelled "Final: Sampler A" and "Final: Sampler B", with dates. Analyze all well water samples, 2 initial rinse, and 2 final rinse samples, as per Water Sample Analysis Procedure. If experience shows that chromium analyses results are consistently below the threshold of detectability for the 2 initial rinse and 2 final rinse samples, further rinse samples may be discontinued.
- Q. Improvements in this procedure, such as the possible use of powered groundwater well sample collection equipment, may be made as future experience dictates.

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GROUNDWATER MONITORING LOG
DIAMOND SHAMROCK CHEMICAL COMPANY
CHROMATE SITE, PAINESVILLE, OHIO

INSTRUCTIONS

The Groundwater Monitoring Log Sheet will be completed for routine groundwater monitoring, any followup monitoring, and investigations conducted pursuant to the Contingency Plan. All samples will be analyzed for hexavalent chromium, total chromium, and pH. Each sample taken will be assigned a number to be used in reporting sample results. Lab data sheets, including associated quality control documentation will be attached to the Groundwater Monitoring Log Sheet.

Groundwater elevations will be expressed in feet (to the closest 0.01) above a standard reference point.

I. INSPECTION INFORMATION

Date of Inspection / /
 month day year

Time of Inspection

Inspectors

Title

Signature

Weather Conditions (Include precipitation data, appearance of the Grand River, etc.)

River Level (Staff gauge reading, or equivalent, to the nearest 0.01 foot)

II. GROUNDWATER MEASUREMENTS/SAMPLING							
Well #	Bailer Volumes Removed	Groundwater Elevation (feet)		Sample Results (ppm)			
		Before Bailing	After Recovery	Sample #	Cr (VI)	Cr (total)	pH
1							
2							
3							
4							
5							
6							
7							
8							
9							
10							
11							
12							
13							
14							
15							

III: Other Observations or Field Data Gathered (Provide narrative description)

IV. ATTACHMENTS (Attach lab data sheets and other pertinent information)